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A VISIT TO THE ZEOLITE LOCALITY AT NORTH TABLE MOUNTAIN, COLORADO

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Caldwell, N. J.

RECENTLY the writer had the interesting experience of visiting the zeolite locality in Colorado at North Table Mountain, one of the foothills of the Rockies, near the town of Golden, about ten miles west of Denver. The zeolites occur at different points in the mountain, as well as at South Table Mountain nearby. In geological formation North and South Table are one mountain, cut in two by the erosion of Clear Creek which winds its way from the Rockies thru Golden and Denver. It was in the waters of Clear Creek that gold was first panned in Colorado. Specimens may most readily be secured at a quarry close to the summit of North Table Mountain; this is reached by a steep climb of several hundred feet from the road along Clear Creek, leading into Golden, where runs a trolley line from Denver. The principal use for the stone quarried at this point is in making blocks to place between the rails of Denver's "tram-ways" as the people of that city style their electric street car lines. About two blasts a year produce sufficient material for the blocks, which are hewn by hand at the quarry. After blasts the larger masses of rock are broken up by means of wedges and then chiseled into shape.

The minerals here found are locally described as "water crystals," an appellation derived from the circumstance that cavities in which they abound often contain a large amount of water; the writer was informed that one had contained "several barrels" of water.

The zeolites from the Table Mountains differ considerably in habit and appearance from those of other localities. The mineral most strikingly typical of this locality is mesolite which occurs in downy aggregations of extremely minute fibers having a resemblance to fluffs of cotton. Exquisite examples are exhibited in the museum of the Colorado School of Mines at Golden. These delicate specimens are very difficult to transport and require to be handled with the greatest care to avoid crushing their extraordinarily gauzy substance. In some cases specimens occur with much stouter fibers, resembling natrolite, and it is difficult to determine whether or not they may be the latter mineral. Another phase of mesolite is a substance like felt or paper, as tho the cobweb-like material had been compressed to a compact mass; this form is called "mountain leather," an appellation also given to some other minerals.

Thomsonite occurs in several forms, which have been described at length by Professor Horace B. Patton of the School of Mines (*Bull. Geol. Soc. Am.*, **11**, 461–474). Some varieties resemble shredded cocoanut, while another phase is spherical in form like the variety from the Faröe Islands termed "mesole" or "faröelite."

Chabazite occurs rather plentifully in pale red to whitish crystals, far less handsome than the specimens from Paterson, N. J., and Nova Scotia. They form a very pretty setting, however, when covered with glassy analcite crystals and the spherical form of thomsonite. Professor Patton in the paper above referred to describes some interesting twinned chabazites.

Analcite is represented in both transparent and milky tetragonal trisoctahedra of sharp form varying considerably in size. The smaller individuals are very clear and bright, the larger usually milky.

Laumontite and stilbite are found, tho as a rule poorly crystallized. The following minerals also occur at the Table Mountains rather sparingly and seldom of a quality suitable for cabinet specimens: Apophyllite, aragonite, calcite, and levynite. An example of the last mentioned rarity is on exhibition in the Colorado Museum of Natural History in Denver.

This locality is prolific in fine cabinet specimens, and at any time well repays a visit.

A recent excavation in the center of the city of Spokane, Washington, has yielded interesting specimens of spherosiderite partially coated with hyalite in cavities in basalt.

THE SO-CALLED FISCHERITE FROM ROMAN GLADNA, HUNGARY[1]

ESPER S. LARSEN
U. S. Geological Survey

THE original "fischerite" from the Urals was described as occurring in small, six-sided prisms and scales belonging to the orthorhombic system and having the following optical properties: Opt. +, $2H_{Na} = 66° 4'$ (variable), $\beta = 1.555$ (?), X = b, Z = c.

Two specimens labeled "fischerite, Roman Gladna, Hungary," have been examined by the author microscopically and altho they fit the description given for the so-called fischerite from this locality, they do not agree at all with the description of the original fischerite.

A specimen kindly furnished the author by Mr. L. P. Gratacap and the Museum of Natural History of New York is made up of colloidal crusts, sensibly isotropic, and having a somewhat variable index of refraction with average $n = 1.51 \pm 0.02$. These data agree with those for planerite, which is reported to be amorphous, and to have an index of refraction of 1.517.

A second specimen from Roman Gladna, kindly furnished the author by Professor Ford from the collections of Yale University, is a white, opal-like enamel. It is made up of layers of minute fibers with positive elongation and sensibly parallel extinction. The different layers have somewhat different optical properties but the average index of refraction is about 1.47 ± 0.01, and the birefringence is moderate. The following data measured by the author on vashegyite from Vashegy, kindly furnished by Colonel Roebling, shows conclusively the identity of the two:

Minute fibers with + elongation; $\beta = 1.48 \pm 0.01$. Birefringence about 0.02.

On the other hand, vashegyite is also reported to be amorphous with an index of refraction of 1.49 ± and this type is possibly identical with evansite, which is in part amorphous with an index of refraction of 1.485.

In common with many other colloidal or metacolloidal minerals the hydrous aluminium phosphates need considerable revision and a readjustment of their nomenclature. Such minerals are commonly variable in their chemical composition and properties and, in addition, the careful microscopic study which is required to determine whether or not the materials described are homogeneous has not always, nor indeed often, been made. A number of such so-called minerals are no doubt mechanical mixtures.

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[1] Published with permission of the Director of the U. S. Geological Survey.

The author would be glad to get a few tiny crystals of fischerite from the original locality for a determination of its optical constants. An equivalent exchange can be furnished, thru the National Museum.

THE PROBABLE IDENTITY OF FISCHERITE WITH WAVELLITE

EDGAR T. WHERRY

In the preceding note Mr. Larsen has shown that the so-called fischerite from Hungary is unquestionably different from the original fischerite. From a study of the literature the writer has come to the conclusion that the original fischerite itself is not a distinct species, but is probably only wavellite.

Crystallographically fischerite is supposed to possess a different prism angle from wavellite; the crystals are, however, very poor and not terminated by pyramids, and are therefore difficult to orient correctly; 61° 28′, the measurement given as made between two prism faces of fischerite may accordingly equally well have been made between one prism face and a side pinacoid face; the corresponding value for wavellite is close to 61°.

The optical properties assigned to the two are essentially identical. The orientation and character is the same; one of the indices of refraction of wavellite is 1.552, and one of fischerite is said to be practically the same, 1.555, the others not being known in the case of this mineral; the axial angle of wavellite is about 75°, while that of fischerite is given as "66° 4′, but variable," and it might readily vary as much as 9°.

The only analysis of fischerite extant was made on a minute quantity of impure material, and except in the water content, may readily be in error several per cent. The water, determined by loss or ignition, is likely to be approximately correct, and the 27.50% assigned to fischerite lies within the limits shown by different specimens of wavellite (26.5–28.3%).

Altho none of the original fischerite has been obtainable for redetermination of its properties, the published descriptions thus certainly indicate the probability of its identity with wavellite.

BOOK REVIEW

THE PRODROMUS OF NICOLAUS STENO'S DISSERTATION. An English version with an introduction and explanatory notes by John Garrett Winter and a foreword by William H. Hobbs, both of the University of Michigan. *Univ. Mich. Studies, Humanistic Series*, Vol. **11**, pt. II, pp. 169–283, 1916. The Macmillan Co., N. Y., 1916.

It is well for the earnest student of science to turn aside now and then from his activities in bringing new facts to light, and to gain relaxation and perhaps inspiration by delving into the history and development of his chosen subject. He will often be surprised at the extent of the knowledge possessed by some of the early workers, and at the applicability of many of their ideas o present-day conditions. Of this the book before us is an excellent illustration.

The name of Steno is familiar to all crystallographers, being associated with the fundamental law of the constancy of interfacial angles. But how few know anything about this pioneer of scientific research, beyond his authorship of this law! Now, however, as the result of the work of Professor Winter, we have a readily accessible translation of the Prodromus, Steno's most important contribution to mineralogical and geological science, as well as a most interesting account of his life and work.

"In reading the Prodromus of Nicolaus Steno," says Professor Hobbs in the foreword, "one should remember that the essay was written near the middle of the seventeenth century, when scientific observation was hardly thought of." Those who observed and recorded natural phenomena too closely in those days were likely to be burned at the stake; Steno escaped this fate by discussing at length the agreement between his observations and scripture, and was able to make highly important contributions to crystallography and to geology.

Steno was born in Copenhagen in 1638, and because of ill health in his childhood was so closely associated with older people that, as he himself wrote, he "grew to prefer the conversation of older people, especially when they spoke of religion, to the frivolous chatter of younger companions." In this circumstance is evidently to be found the principal source of the powers of observation and logical reasoning which he later displayed. [How much more rapidly the world's knowledge would be advanced, were more children granted the same opportunity!] He studied medicine at the University of his native city, and also in Amsterdam, Leyden, and Paris, where he carried on extensive and important investigations in anatomy; it is noteworthy that the list of his writings includes 24 titles on anatomical subjects.

In 1665 he went to Florence and became attached to the court of Grand Duke Ferdinand II. Here he became interested in geology and mineralogy, and prepared the Prodromus. He later returned to Copenhagen, but having meanwhile embraced the Roman Catholic faith, he turned from science to theology, and during the remainder of his life occupied himself with religious controversy. After a rather stormy career in various clerical positions, he finally died as a result of self-inflicted privations in 1686.

Plates of the two extant portraits of Steno are included in the book, one painted during his stay in Florence, and the other while he was Vicar of Schwerin, the results of his asceticism being strikingly shown in the drawn features of the latter.

The character of the Prodromus and the quality of the translation may be brought out by a few brief quotations. It starts out:

> Most serene Grand Duke: Travellers into unknown realms frequently find, as they hasten on over rough mountain paths toward a summit city, that it seems very near to them when they first descry it, whereas manifold turnings may wear even their hope to weariness. For they behold only the nearest peaks, while the things which are hidden from them by the interposition of those same peaks, whether heights of hills, or depths of valleys, or levels of plains, far and away surpass their guesses; since by flattering themselves they measure the intervening distances by their desire.

How this applies to scientific investigation is then pointed out. Steno excuses his delay in preparing a report on his investigations on the above basis; his words concerning his experience will appeal to the active scientist of today:

> I should gladly have postponed everything until it had been possible for me, on my return to my native land, to perfect the details, were I not awaiting the same fortune there which I have hitherto experienced everywhere, in that new tasks have constantly stood in the way of finishing those first undertaken.

Accordingly this Prodromus or preliminary statement of principles was prepared, and a fuller report promised; the fulfillment of this promise being unfortunately prevented by the circumstances of his subsequent life.

The sub-title of the essay, "concerning a solid naturally contained within a solid" is his way of explaining that he intended to discuss the solid objects, fossils and crystals, found imbedded in the solid rocks of the earth. When we consider the absurd theories as to the origin of natural objects of this sort customarily held in those days, it is particularly surprising to read:

> That the strata of the earth, as regards the place and manner of production, agree with those strata which turbid water deposits. That the crystals of mountains [i.e., rock-crystal = quartz] as regards the manner and place of production agree with the crystals of niter [this term evidently referring to some familiar artificially crystallized substance] although it is not therefore essential that the fluid in which they were produced should have been aqueous. That those bodies which are dug from the earth and which are in every way like the parts of plants and animals, were produced in precisely the same manner and place as the parts of the plants and the animals were themselves produced.

He further pointed out the difference between the growth of animals and plants on the one hand and crystals (angular bodies in his terminology) on the other; the difference between the mode of deposition of incrustations, such as agate, onyx, eagle-stone (limonite geodes), etc., and the mode of formation of crystals; and the fact that the earth's strata were deposited horizontally, but have subsequently been uplifted into their present inclined positions.

The chapter headed "Concerning the Crystal" is the one of particular interest to mineralogists, for in it he describes in detail the features shown by quartz, demonstrating among many other things that the angles between corresponding faces are constant, no matter what the shape of the face or its distance from the center of the crystal. Unlike most of his contemporaries and indeed many of his successors, he was willing to admit his lack of knowledge on certain points; thus he says:

> As regards the formation of crystal, I would not venture to declare in what manner its first shape is produced . . .

As a matter of fact the cause of its shape was not found out, until it became possible to study quartz crystals by X-rays, some 245 years after he wrote these words.

He further describes in some detail what we now know as phantom crystals, symmetrically arranged inclusions, and parallel growths of crystals, and it is evident that many of his conclusions as to the nature of crystal growth were founded on his studies of such phenomena.

Other crystallized minerals which came to his attention were hematite, referred to as "angular bodies of iron," native copper and silver, diamond and "marcasites," which from what he tells of its crystal form we can recognize as pyrite.

Of his accounts of fossil shells and plants, and of the mode of formation of mountains and other natural phenomena nothing need be said at this point except that they were also far in advance of the accounts written by his contemporaries. The attempt to reconcile these observations with scripture, which concludes the book, might be regretted, were it not that they enabled the whole essay to pass the religious censor, a copy of whose opinion is appended. Professor Winter is certainly to be warmly commended for making the work of this pioneer of scientific research available to his humble successors.

E. T. W.

REVIEW OF TWO RECENT PAPERS ON CRYSTAL STRUCTURE

THE CONSTITUTION AND FUNDAMENTAL PROPERTIES OF SOLIDS AND LIQUIDS. Part I. SOLIDS.

IRVING LANGMUIR, of the General Electric Co., Schenectady. *J. Am. Chem. Soc.*, **38**, (11), 2221–2295, 1916.

The present reviewer, having had five years experience in teaching mineralogy, and having become familiar with the methods of several other teachers both in this country and abroad, has long felt that crystallography has no more right to be considered an integral portion of mineralogy than dynamics would have to be classed as a branch of horticulture, merely because Newton formulated the laws of motion and gravitation as a result of his observation of the fall of an apple. It happened that crystallography was first developed as the result of the study of minerals, for the simple reason that minerals are more extensively and perfectly crystallized than any artificial substances known in the middle ages, or, indeed, at the present day. And so, to this day, the youth in college is burdened with a series of harsh crystal names which he does not understand and with crystallographic formulas which he never sees the use for, at the very outset of his course in mineralogy. Small wonder that, with the always dominating first impressions thus indicating the subject of mineralogy to be a dry and uninteresting one, so few become sufficiently interested in it to ever contribute to its advancement. Crystallography is fundamentally a branch of chemistry, and in particular of physical chemistry, so it is gratifying to find that at last one of the most eminent of the younger American physical chemists has found in the results of advanced crystallographic research a means of explaining certain hitherto obscure phenomena connected with the constitution of solids (and even of liquids!).

That the molecules recognized by the chemist as essential attributes of all chemical compounds are in general not present as such in the crystallized forms of these compounds is not a new idea; it has been urged by Professor Groth of Munich and some of his students and associates for many years; but only the work of the Braggs,[1] emphasizing the validity of this view by the actual demonstration of the exact positions occupied by the atoms in the crystals of some 20 crystalline substances, has succeeded in convincing the chemical world. The elaborate paper under review is an able presentation of the effect of this view on chemical theories. The portions of interest to mineralogists are outlined in the next paragraph.

The work of the Braggs and others on the study of crystal structure with the X-ray is reviewed, and the structures are described which have been found to exist in the minerals halite, sylvite, diamond, sphalerite, fluorite, pyrite, hauerite, calcite, dolomite, rhodochrosite, siderite, magnetite, spinel, copper, silver, gold, lead, sulfur, quartz, zircon, rutile, and cassiterite. The inevitable conclusion is admitted,—that in these crystallized substances the atoms can not be held together by the ordinary valence relations, but must be united by "secondary valence," the importance of which has been brought out by Werner and others in recent years. In these substances, which belong to the class of "polar compounds," the whole crystal must be regarded as a single molecule. From theoretical considerations it is argued that in "non-polar" compounds (mostly hydrocarbons and their derivatives), group-molecules are present, in which the atoms are held together by primary valence altho these in turn are bound together into the crystal by secondary valence.

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[1] One or more articles on this subject will appear in this magazine in the near future. Ed.

All forces between atoms are therefore chemical, and the old conception of physical forces (adhesion, etc.) as distinct from chemical ones is untenable. Many solid crystalline compounds including minerals do not show the composition which would be predicted from the ordinary rules of valence. The remainder of the paper is occupied with consideration of various chemical phenomena such as evaporation, adsorption, etc., for details concerning which those interested are referred to the original. See also the following review. E. T. W.

THE COMMON REFRACTORY OXIDES. Robert B. Sosman, of the Geophysical Lab. *J. Ind. Eng. Chem.*, **8**, (11), 985–990, 1916.

This article, while nominally a presentation of the properties and behaviors of oxides of high melting point, includes considerable discussion of the constitution of certain crystalline minerals, and in a sense is supplementary to Dr. Langmuir's paper, which was treated in the preceding review, altho the two papers were prepared entirely independently. The properties of the oxides of five elements (Si, Al, Mg, Ca, and Fe) and of the products obtained by melting two or three of them together are described. Some of these are known as minerals, others have not as yet been observed in nature. It is shown that these oxides tend to unite in simple numerical proportions, regardless of what might be expected from primary valence relations of the elements concerned. The silicates and other compounds of these oxides thus appear to be essentially "molecular" compounds, altho the conception of molecular compound now held is not that of Berzelius, in vogue a hundred years ago, according to which salts consisted of distinct acid and base radicals. The structural formula and the fixed valence theory have been of great value in organic chemistry, but attempts to extend them into the inorganic field "have resulted principally in confusion." For example, the mineral sillimanite, which according to the new views is a simple, normal compound of two oxides, Al_2O_3 and SiO_2 in the ratio 1:1, has to be laid aside when an attempt is made to assign a structural formula to it as a "possible basic metasilicate." The remainder of the paper comprises a brief outline of the results of the X-ray study of crystal structure and the practical applications of the theories discussed to such technical industries as the manufacture of porcelain, refractories, and abrasives. E. T. W.

HOW TO ETCH METEORITES

THE EDITORS

THE surface to be investigated is first ground flat and smooth; the larger the surface the greater will be the opportunity afforded to study the details of its structure. The Foote Mineral Company's method of etching is as follows:[1]

1. Wash the specimen with benzine.

2. Lacquer the unpolished back and edges with a lacquer known as "steel gloss" diluting to about one-half with benzine. When this side is dry, carefully remove with benzine any lacquer which may have run over the edges onto the polished surface. An electric fan hastens the drying of the lacquer.

3. Lacquer any nodules. They should be completely covered, as they are readily attacked by the acid, and will stain the etched surface.

4. Place the iron so that the polished surface is horizontal. Wash with 5 to 15 per cent solution of C. P. nitric acid for from 15 seconds to 4 or 5 minutes, until the etching is brilliant. If etched much longer, the iron will darken. When the surface begins to get rough, the maximum brilliancy has been reached. The acid should be kept as thick and as even as possible by rubbing the plate with a large brush. As the acid becomes discolored, it should be brushed off and clean acid added.

5. To clean and facilitate rapid drying, quickly put the section into clean warm water (120° to 130° F.) for several minutes, rubbing with a brush.

6. Dry in a few seconds with blotting paper.

7. Thickly lacquer the etched surface at once. To avoid oxidizing, the operations from 4 to 7 should be accomplished as quickly as is practicable, by having all the materials at hand.

PROCEEDINGS OF SOCIETIES

NEW YORK MINERALOGICAL CLUB

The regular meeting of the Club, held at the American Museum of Natural History of New York on January 10th, 1917, President J. G. Manchester presiding, was devoted to exhibits of specimens of zeolites and associated minerals of special interest, chiefly from the private collections of, and with explanatory descriptions by, the exhibitors, as follows:

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[1] From "Meteorites, Their Structure, Composition, and Terrestrial Relations," Oliver C. Farrington; Chicago, 1915.

Messrs. G. S. Stanton, William H. Broadwell (Secretary of the Newark Mineralogical Society), G. L. Van Dusen, Charles W. Hoadley, Ex-President George E. Ashby, President James G. Manchester, and the Secretary. Each presented selections of specimens from numerous celebrated localities, but chiefly from those of New Jersey.

Dr. L. P. Gratacap (the Curator of the Museum and the Club collection), represented by Mr. G. S. Stanton, exhibited a selection of Iceland and Faroe Island zeolites from the Bement and Spang Collections of the Museum of Natural History, accompanied by an account of their mode of occurrence and of the geology of the Faroe Islands [abstracted from Dr. J. Curries' paper in the *Trans. Edinburgh Geol. Soc.* **9**, 1].

Dr. Gratacap also had exhibited a specimen showing numerous large and very perfect feldspar crystals on a flat granite matrix, which had intruded into cloudy quartz, that came away with its molds of the crystals, leaving them intact. The crystals are 2–5 inches in dimensions, and the group about 15 by 12 inches across. The specimen, which came from a quarry at Mystic, Conn., was presented to the museum by Mr. George S. Scott.

Mr. R. Broadbent, a visitor from Australia, was then introduced, and gave a very interesting account of the present condition of the Broken Hill mines, New South Wales.

In conclusion the Secretary presented a series of lantern slides, photographs, and photomicrographs, made by himself from specimens of zeolites too fragile to transport, or showing features of special interest.

WALLACE GOOLD LEVISON, *Secretary.*

THE PHILADELPHIA MINERALOGICAL SOCIETY

Wagner Free Institute of Science, January 11, 1917

PRESIDENT Trudell in the chair. Those present were Messrs. Allen, Benge, Biernbaum, Bradford, Egee, Flack, Gordon, Hagey, Jones, Knabe, Leffmann, Trudell, Vanartsdalen and Warford.

The subject of the evening was an exhibition of minerals from the Phoenixville, Perkiomen and Falls of French Creek Mines, many fine specimens being exhibited by Messrs. Benge, Biernbaum, Gordon, Egee and Trudell, with brief oral communications. Mr. Biernbaum also exhibited hematite from Lake Superior.

Dr. Leffmann proposed that the ruling requiring proposed members to have attended two meetings before election be abrogated.

Mr. Gushing was proposed by Mr. Benge for membership and elected.

Messrs. Benge and Trudell told of a recent reunion of two of the founders of the society, Mr. Henry G. Ives and Mr. James Richardson, at Mr. Benge's house.

The council proposed a series of 18 excursions for 1917; these will be duly announced in this column.

SUNDAY, MARCH 25; meet at Market St. Ferry, 7.45 A. M., for trip to Mullica Hill, N. J.

SAMUEL G. GORDON, *Secretary.*

NEW MINERALS

Spencerite

T. L. Walker, of the University of Toronto; *Spencerite, a new zinc phosphate from British Columbia; Nature,* **97,** 374, 1916; abstracted in *Am. Min.,* **1,** (3), 48, 1916; *Mineralog. Mag.,* **18,** (83), 76–81, 1916.

Name: After Mr. L. J. Spencer, of the Mineral Dept. of the British Museum (Natural History).

PHYSICAL PROPERTIES

Color: white. Luster: pearly, occasionally vitreous. Form: lamellar masses, radiating and reticulated crystals with eroded ends. H. = 3. Sp. Gr. = 3.145. Powdered mineral fuses readily at a moderate red heat.

CRYSTALLOGRAPHIC AND OPTICAL PROPERTIES

Probably monoclinic. Cleavage: 100, very perfect, 010 and 001, slightly less so. β_{na} = about 1.6092. $2H_y = 46°26' \therefore 2E_y = 81°34'$; $2V_y = 47°54'$. Optically $-$. $Bx_{ac} \perp 100$. Birefringence low. Dispersion $\rho > v$. Thin sections show polysynthetic twinning with an extinction angle of about 6°, composition face 100.

CHEMICAL PROPERTIES

Composition: $Zn_3(PO_4)_2 \cdot Zn(OH)_2 \cdot 3H_2O$.

	I.	II.	III.	IV.	Theory.
ZnO	60.18	60.18	60.05	60.39	60.32
P_2O_5	26.14	26.23	26.74	26.13	26.32
H_2O at 160°	9.79	9.83	13.70	13.44	10.02
H_2O above 200°	3.53	3.47			3.34
MnO	—	—	0.41	—	—
SiO_2	—	—	0.40	—	—
	99.64	99.71	101.30	99.96	

Analyses I and II by Walker, III by E. W. Widdowson, IV by Phillips.[1]

Readily soluble in acids; on adding ammonia to the acid solution a heavy white precipitate forms and dissolves in excess of the reagent thus resembling the other zinc phosphates. In the closed tube the mineral decrepitates and yields water in abundance. While hot the mineral is yellow, becoming white on cooling, thus indicating the presence of a basic salt of zinc.

Occurs as the central portions of stalactites of hemimorphite (calamine) at the Hudson Bay zinc mine about 5 miles east of Salmo, near Nelson in the West Kootenay district of British Columbia. (Spencerite is evidently a weathering product of hydrothermal deposits.) S. G. G.

Radio-strontium, a so-called new mineral.—In several "popular science" publications notices have recently appeared of the pretended discovery in North Carolina of "a new mineral, radio-strontium," which is alleged to possess medicinal value. We have been informed on competent authority that the material so named is a sort of luminous paint. This has a decided advantage over other quack remedies in that it can be used to paint keyholes, to aid in their location during the early hours of the morning. It seems hardly necessary to state, however, that it is not in any sense a new mineral.

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[1] *Am. J. Sci.,* [4], **42,** (3), 275–278, 1916.

Crandallite

G. F. Loughlin and W. T. Schaller, of the U. S. Geol. Survey. *Crandallite, a new mineral. Am. J. Sci.*, [4], **43,** (1), 69–74, 1917.

Name: After M. L. Crandall, mining engineer, Provo, Utah.

PHYSICAL PROPERTIES

Color: white to light gray, with shadings into yellow and brown. Streak: white. Luster: dull, somewhat greasy in the compact variety, and somewhat pearly in the coarser lamellas; almost opaque. Form: compact to cleavable masses. Under the microscope these are seen to be aggregates of extremely fine fibers, generally in radiating groups. From this it is believed that crandallite is a fibrous mineral resulting from the alteration of some mineral similar in composition (goyazite?) with a platy structure and smooth cleavage surface. H.=4.

OPTICAL PROPERTIES

Under the microscope pure crandallite is colorless and non-pleochroic. Indices of refraction: minimum, 1.585; maximum, 1.595. Birefringence, 0–0.01. Fibers apparently have parallel extinction, and the elongation is negative. Some poorly defined hexagonal plates are isotropic, uniaxial, postive, and on edge give parallel extinction, and a moderate birefringence (0.01–0.02); n=1.605 to 1.62. Some of the plates are uniform in structure and isotropic; others show a concentric, radiating, fibrous structure.

CHEMICAL PROPERTIES

Composition: $CaO.2Al_2O_3.P_2O_5.5H_2O$; with slight replacement of CaO by SrO and MgO, and P_2O_5 by SO_3.

Analysis by Schaller gave: insol. 35.13, Al_2O_3 25.16, CaO 4.88, SrO 1.44, MgO 0.61, P_2O_5 17.61, SO_3 2.47, H_2O-0.84, H_2O 12.26, sum 100.40. Insol.= SiO_2 with a little barite, and traces of sulfides.

B. B. crandallite decrepitates somewhat, then exfoliates slightly and fuses to an opaque white enamel, coloring the flame intermittently a pale green (P) with occasional flashes of red (Ca and Sr). In the closed tube decrepitation occurs with liberation of H_2O. Soluble in acids.

Crandallite was found on the dumps of the Brooklyn mine, one and a half miles east of Silver City, in irregular shaped cavities of a quartz barite ore aggregate, associated with pyrite, enargite, galena and sphalerite, and to a minor extent replacing them. It occurs covered with a thin crust of tenorite.

S. G. G.

EXCHANGE NOTICES

Louis Reamer, Box 175, Short Hills, N. J. Western and New Jersey minerals, including babingtonite, laumontite, *stevensite,* gypsum pseudomorphs, chiastolite, franklinite crystals, gmelinite, covellite, etc. Send list of what you have.

A. J. Rice, 1041 Wood St., Easton, Pa. Minerals from the famous Easton serpentine quarries.